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ABSTRACT

The authors describe many current school design responses to mainstreaming as limited in scope, focusing mainly on barrier free environments. This approach, they suggest, is an incomplete one to a wide range of problems in mainstreaming. An analysis of the literature is seen to demonstrate that barrier free design is casually substituted for the broader concept of mainstreaming. The authors discuss physical solutions to provide environments which promote children's interaction, positive self image, confidence, and accessibility, while allowing for learning and development. (CL)

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MAINSTREAMING HANDICAPPED CHILDREN: BEYOND BARRIER-FREE DESIGN[1]

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ABSTRACT

Educating handicapped children in the least restrictive environment--including integration in public school facilities--is an emerging trend called mainstreaming. Presently, design responses to the new needs created by mainstreaming are limited in scope and focus mainly on barrier-free environments. Barrier-free design is an important but incomplete approach to a wide range of problems in mainstreaming.

In an applied research reported here, an analysis of the literature demonstrates the casual substitution of barrier-free design for the broader concept of mainstreaming. Research findings point toward a series of issues involved in supporting shared experiences and common settings for exceptional and regular children. Physical solutions responsive to these problems require new design principles. These principles suggest the important characteristics of environments which promote children's interaction, positive self-image, confidence, accessibility, and allow for learning and development.

CONTEXT

Approximately 10% of all school age children in this country experience some sort of handicap, and therefore require some assistance in addition to the regular educational curriculum (Molloy, 1974). Historically, many of these children were educated apart from "normal" children for a variety of reasons, including:

- a lack of adequate facilities to serve both handicapped and non-handicapped children.
- educational programs for the handicapped which required specialization, self-containment, and isolation from others.
- belief that the quality of education available for "normal" children would be compromised if handicapped children were included in the same programs.

Mainstreaming: A Design Approach for All Handicapped

During the past few years, societal attitudes towards handicapped people have undergone major change. It is now accepted that entirely separate educational programs deny handicapped children full opportunities for intellectual and social development. A series of court decisions in several states, particularly in Pennsylvania, Louisiana and the District of Columbia, have paved the way for passage of Public Law 94-142 (1975). This law guarantees the rights of handicapped children to be educated together with their non-handicapped peers. Although there are several different interpretations of the principles set forth in PL 94-142, the most commonly accepted interpretations are based on the cascade model (Reynolds, 1962--see Figure 1). In simplified terms, it provides for education of the handicapped in the least restrictive environment appropriate for each child's ability.

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Barrier-Free Environment: A Design Approach for the Physically Handicapped

The impetus towards development and acceptance of mainstreaming theories has come about at a time of national awareness of the wide range of needs of handicapped persons. One of the most visible areas of action has been the adoption of a policy for barrier-free environments. Barrier-free design is the process of making buildings accessible for persons who are physically handicapped. Some of the actions which have been taken to assure adherence to barrier-free principles include:

- developing and adopting the American National Standard Institue (ANSI) specifications for making buildings accessible to, and useable by, the physically handicapped.
- publishing booklets in many states, notably North Carolina and Illinois, which set forth and illustrate building standards for the physically handicapped.
- establishing private and public agencies (e.g., THE NATIONAL CENTER FOR BARRIER-FREE ENVIRONMENTS, THE ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD, and others) which promote "barrier-free" awareness and compliance.

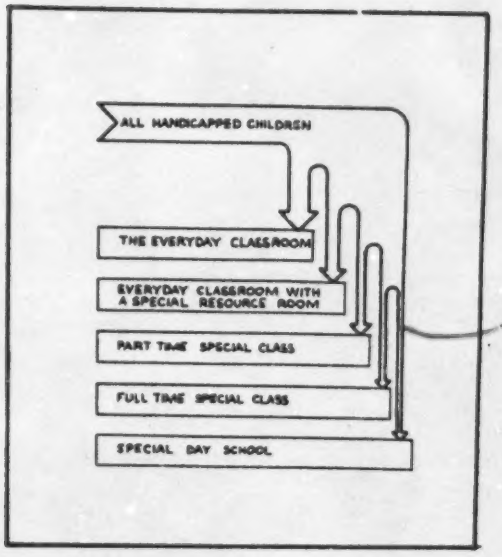
ALL HANDICAPPED CHILDREN
THE EVERYDAY CLASSROOM
EVERYDAY CLASSROOM WITH A SPECIAL RESOURCE ROOM
PART TIME SPECIAL CLASS
FULL TIME SPECIAL CLASS
SPECIAL DAY SCHOOL

Figure 1: The cascade model of the least restrictive environment for educating handicapped children (after Reynolds, 1962).

Issues in Implementing Mainstreaming

A great amount of human energy and capital expenditure has been invested in order to implement mainstreaming objectives of integrating handicapped and non-handicapped children within the same educational settings. The most common problems which educators have identified, and begun to deal with, include:

- revising previous exceptional education programs which mandated segregation of handicapped children in order to conduct specialized teaching and therapy programs.
- breaking down prejudices which many people, including parents and teachers, have borne against handicapped persons and mainstreaming.
- modifying facilities which by the nature of their design restrict mainstreaming.

In efforts to overcome these problems, most educational theorists and practitioners have encouraged:

- revising attitudes about, and methods of, exceptional education, and developing new programs which recognize the different needs of various types and degrees of handicaps. Most programs have been redeveloped in some degree of accordance with Reynold's cascade model.
- re-training regular classroom teachers in order that they may be qualified to teach handicapped children in normal classroom settings, and sensitizing teachers, as well as parents, to be aware of the benefits to be gained by handicapped and normal children as a result of mainstreaming.
- modifying school environments to satisfy the needs of handicapped children by adopting barrier-free design principles. Many schools have already been modified to comply with barrier-free standards through the additions of elevators, ramps, wide doors, and other alterations.

THE PROBLEM

A major problem which has not been confronted in designing schools for mainstreaming is that many school administrators and architects conceive of barrier-free design as being the same as design for mainstreaming. Most of the attempts to adjust school environments for mainstreaming have been in the realm of "barrier-free compliance". However effective barrier-free guidelines are in satisfying the environmental needs of persons in wheelchairs, these guidelines offer very little benefit to persons with other types of handicaps. Physically and orthopedically, the handicapped, including wheelchair users, comprise a very small portion (approximate 10%) of the total population of handicapped children in exceptional education programs. The other basic handicap types served include: blind, hearing impaired, learning disabled, emotionally disturbed, and mentally retarded. (See Table 1) It is evident that ramps, elevators, wider bathroom stalls, and similar modifications for barrier-free environments are not directly relevant to the special needs of close to 90% of the school-age handicapped.

Table 1: Distribution of disabilities among all children.

Disability Type	1968 BEH Estimates[a]	1978 BEH Reports[b]
Speech Impaired	3.5%	3.5%
Mentally Retarded	2.3%	2.3%
Learning Disabled	1.0%	2.0%
Emotionally Disturbed	2.0%	2.0%
Hearing Limited	.6%	.11%
Visually Limited	.1%	.06%
Physically Handicapped	.5%	.5%
	10.0%	10.47%

Sources:

[a]US Office of Education, Bureau of Education for the Handicapped, 1969; from Kirk, 1972.

[b]US Office of Education, Bureau of Education for the Handicapped, 1978; from Blessing, 1978.

Reasons for this Problem

There are several reasons why most of the activity in modifying schools to accomodate mainstreaming have been limited to barrier-free design:

- physically handicapped children are the most visible and identifiable of all handicap types. Children with learning or emotional difficulties, for example, often are not identifiable by laypersons or even by many educators. Wheelchair users are easily spotted by everyone and therefore, the presence of this group is perceived to be a far greater proportion of the total handicapped population than they actually are.
- problems of negotiating the physical environment appear to be more critical for wheelchair users than the environment-related problems of other types of handicapped persons.
- solutions for wheelchair accessibility have long been established, tested, published, and are now well within the vocabulary of all architects.
- beliefs among many educators that mainstreaming is solely an educational concept and that developmental and educational goals can only be achieved through educational programs. A common assumption is that schools' physical environments are background rather than a significant factor in mainstreaming programs.
- another position about this subject is that little design for mainstreaming should be done at all because the world outside of school does little for handicapped persons, and therefore, provision of modified school environments presents unrealistic accomodation, which is contradictory to mainstreaming objectives.

The Limited Scope of Present Design Interventions

The following examples demonstrate that in reality very little attention has been given to the ways in which facility design may support mainstreaming, other than providing barrier-free environments. These examples are a few of the many compliance plans, published programming and design guides, and actual design or remodelling projects of school facilities which have been developed explicitly to provide environments supportive of mainstreaming programs.

(1) THE COMPLIANCE PLAN FOR SECTION 504 OF THE VOCATIONAL REHABILITATION ACT OF 1973 sets forth the intentions of a local public school system to provide educational programs and facilities which would comply with state and federal mainstreaming regulations. This report inventories all local school buildings, and indicates which modifications are required at each facility to comply with ANSI 117.1 standards for the removal of architectural barriers. The entire discussion in this report regarding environments for mainstreaming is related to barrier-free design. None of the report discusses architectural implications for other handicap types.

(2) PLACES AND SPACES: FACILITIES PLANNING FOR HANDICAPPED CHILDREN (Aiello, 1976) is a document published by the Council for Exceptional Children, intended to serve architects and educators as a resource for facility planning for exceptional education. The beginning sections of the book present a good discussion of the many issues to be dealt with in regard to designing for mainstreaming. It is noted in the book that children of different handicap types have

different environmental-related needs. The cascade model is cited as a conceptual framework which can assist in the development of "design for mainstreaming" strategies. These are based on the need for integration and variety of settings for learning in order to serve handicapped children in the "least restrictive environment". However, nearly half of the book is devoted to presentation of design suggestions which relate exclusively to barrier-free design.

(3) ONE OUT OF TEN: SCHOOL PLANNING FOR THE HANDICAPPED (Molloy, 1974) is one of the most popular resource booklets read by architects and educators. The foreword of the book clearly states that the publication is not about architectural standards for barrier-free schools and argues that barrier-free facilities represent only a small facet of the total mainstreaming problem. Molloy presents various plans for serving handicapped children at different levels of the continuum between special institutions and everyday classrooms.

It appears that creative educational approaches towards mainstreaming have been developed at many of the public schools described in ONE OUT OF TEN; however, in the schools described as mainstreamed, environmental adaptations have not been nearly as advanced as the educational program. The environment-related interventions at schools described include basically provisions for specialized programs in existing, converted, or newly-constructed floors, wings, and annexes. At most of these schools handicapped children have very little interaction with regular children except while at lunch or outdoor play.

TOWARDS DESIGN RECOMMENDATIONS FOR ALL HANDICAPPED CHILDREN

There has been considerable work undertaken recently to develop criteria for designs which support the wide variety of educational and developmental needs of various types of handicapped children. However, environment-behavior research in general, and handicapped-related research in particular, are still largely unknown to most educators and architects. Application of new information regarding design implication for other than physically handicapped has been limited to specialized facilities, which primarily serve a limited user population. Little of this knowledge has been translated and generalized to the design of shared facilities, e.g., public schools.

A review of the literature yielded a solid foundation of design recommendations for specialized settings. For example, the Joseph E. Cole Recreation Center in Washington, D.C. is a building which supports the particular needs of the mentally retarded. One of the many special design responses in this building are the carefully considered sight lines which make it possible for a retarded visitor to catch glimpses of various activities in interior spaces. This design feature responds to the mentally retarded's need to reduce uncertainty and fear of the unknown. Another provision is numerous niches where the wary user can retreat to until ready to face further exposure. Still another environmental feature of this building is color-coded areas, provided for those who cannot read or count, to reinforce learning through multiple coding and repetition.

The use of colors for form recognition and identification is one of the many recommendations of Bayes and Francklin (1971) for the mentally retarded. Other recommendations include provision of managable levels of complexity in the environment to encourage explorative behavior because mentally retarded often become bored easily and are reluctant to explore. Other provisions include direct control of light, sound, heat, etc., rather than remote control of these elements, as a way of demonstrating and teaching direct con ections between causes and effects.

Recommendations for learning environments for those with learning disabilities include suggestions by Bayes (1971) that a range of stimulation be included in facility design, in response to the nature of many learning disabled children, which ranges from hyperactive to hyperdistractable. For example, Bayes recommends the use of non-stimulating environments, such as quiet study booths, to reduce sensory overstimulation for hyperdistractable children. A study by the Council For Exceptional Children (1969) documents the successful use of this strategy. Places for emotional release are recommended for hyperactive children.

Learning environments for emotionally disturbed children require a different set of design recommendations. Adjacent active and passive areas, indoors and out, are recommended. This enables a child to change from one activity to another and allows for immediate change of pace and mood. Close integration between indoor and outdoor spaces is recommended to provide a balance between the natural and the man-made world (Hough, 1971). By allowing an emotionally disturbed child to move freely between inside and outside, feelings of isolation and confinement are reduced.

For the hearing impaired, several sources suggest that carpeting be used in classrooms in order to reduce distracting backbound noises (Bayes, 1971). During interviews with teachers at Milwaukee public schools, several expressed the thought that careful window placement would assist children who lip read by reducing glare and other visual distractions.

Developmentally supportive design recommendations for all handicapped children have been developed by Moore, Cohen, Oertel, and Van Ryzin (1979). Among the many issues addressed in their design

guide are imageability and orientation. It is argued that each time an exceptional child enters a place he may see it anew; the novelty and complexity which may be stimulating for a normal child may only serve to confuse an exceptional child. It is recommended that environments for all handicapped children be knowable, that cues be provided, and that there should be visual orderliness and consistency among spaces.

It is apparent that a significant amount of design information has been developed to support environment-related needs of various handicap types. However, most of the application of this knowledge, to date, has been limited to specialized facilities, which only serve people with specific handicaps. Very little of this knowledge has been transferred and applied to design for mainstreaming in public schools.

TOWARDS NEW DESIGN PRINCIPLES FOR MAINSTREAMING

This applied research project was aimed at:

(1) identification of mainstreaming issues which are related to spatial and physical organization of educational facilities.

(2) development of design principles which describe the important characteristics of environments more responsive to mainstreaming issues.

Research activites included comprehensive review of the literature, site visits and observations of users in their daily routine, interviews with teachers and school administrators, and solicitation of experts' opinions. An in-depth study is currently under way to verify and complete tentative findings, and to test potential design applications through a panel of experts' review. The generation and communication of design applications was greatly aided by a process and format developed for this and similar programming guides.[2]

Design Principles: An Approach to Programming and Design

An important part of any user-based programming for building design is the articulation of basic goals or issues to which the designed environment should respond. These issues should be generated from the basic purpose of the facility, e.g. education and socialization of children. This global goal is then branched out to broad, inclusive goals such as motor, cognitive and social-emotional development. The list then continues with specific goals such as eye-hand coordination. A closely related way to organize programming for design is to identify important user-relevant issues, e.g., the need for graded challenge in the environment. These issues become the target for intervention by design.

Both methods are responded to by design principles. These principles suggest critical environmental factors and characteristics of those settings which will facilitate the goals or resolve the issues. As developed in the last few years, design principles are intended to be abstract, general, evocative, and suggestive of a range of design options. Architects always use design concepts, like "this central spine." But these concepts are seldom behaviorally-based, they most often are very few in number, and they are very seldom evaluated or even questioned seriously. The notion of design principles advanced here are much like that of Alexandrian patterns (Alexander, Ishikawa, and Silverstein, 1977) in that they are behaviorally-based, argued on the basis of serious problems and research literature on those problems, are several in number, and are testable. But Alexandrian patterns are often criticized as being too concrete, specific and dogmatic. An attempt was made to communicate graphic images which would provide specific direction and information suggestive of a range of design solutions, and thus which would stimulate the designer's imagination and intuition while avoiding overly doctrinaire and absolute solutions that might inhibit design innovation.

Some Mainstreaming Issues

There are some traditional programmatic approaches to mainstreaming, around which our design guidelines are evolved. The basic and typical arrangements for mainstreaming handicapped children in public schools includes the following:

(1) handicapped children participate in every activity and perform in the same settings as regular students, with some special attention.

(2) same as (1), with the addition of resource room to which the handicapped will go for variable time intervals to get remedial instructions and training.

(3) special education room or zone for the handicapped with some contact and sharing of activities with regular students during lunch, in physical education or art classes, or meetings in lobbies or corridors.

Other options for educating the handicapped include variants on the theme of specialized facilities in segregated settings; the potential for mainstreaming here is very small or non-existent.

In each of the mainstreaming modes of operations, several issues persist:

- the need for exceptional children to meet and interact with regular students.
- the need to provide the handicapped supportive social, educational, and physical environments without compromising the quality of education for the regular students.

Specific Issues and Design Responses

The following table is a summary of selected issues and goals identified as important for mainstreaming. These issues were found to have implications for design and organization of the physical environment. The items range in importance and scale; for example, SETTINGS FOR SHARED ACTIVITIES is a comprehensive, general, and most important physical design implication of mainstreaming needs. EMOTIONAL RELEASE AREAS is a specific response for an issue which is more important to selected user groups--e.g., emotionally disturbed and learning disabled--and less critical (yet applicable) to other user groups. Each design principle is clearly a response to more than one issue. For the purpose of simplified communication, the following table relates design responses to the most related issue only.

Selected Mainstreaming Issues and Goals	Primary Principles for Design Response
• FOSTERING SOCIAL INTERACTION, COMMUNICATION, AND COOPERATION BETWEEN EXCEPTIONAL AND REGULAR CHILDREN	• SETTINGS FOR SHARED ACTIVITIES including multi-functional rooms, and specialized activity areas which overlook or share regular education spaces. • COMMON ENTRY AND CIRCULATION the use of the same public circulation paths, entries, waiting and gathering areas, both indoor and outdoor, by all children. • PROXIMITY BETWEEN REGULAR AND SPECIALIZED SETTINGS where specialized areas are required, they should not be clustered, and should be in proximity to regular activity areas. • RANGE OF SOCIAL SETTINGS spaces for variety of group sizes--from two and three to large gatherings--for different social encounters
• THE DEVELOPMENT OF EXCEPTIONAL CHILDREN'S POSITIVE SELF CONCEPT AND CONFIDENCE	• SCHOOL WITHIN HOME RANGE to foster sense of belonging, increase interaction with peers, and reduce potential stigma due to special treatment, e.g., handicapped busing • PACED ALTERNATIVES AND GRADED CHALLENGES to provide varied opportunities for success to every level of ability • CLEAR ACCOMPLISHMENT POINTS to provide clear points of completion and public display of accomplishments

• PROVIDING FOR EMOTIONAL DEVELOPMENT AND EMOTIONAL RELEASE	• RETREAT AND BREAKAWAY POINTS a place for individuals and groups to be away from others, or to disengage from activity and retreat to without feeling of failure. • EMOTIONAL RELEASE AREAS a place for expression of emotional anxieties and non-destructive release of frustration and anger
• PROVIDING EMOTIONAL SECURITY	• PREDICTABLE AND FAMILIAR SETTINGS non-institutional building scale and image, and spaces which allow to predict ahead of entry what behavior is expected
• ACCOMODATING VARIETY OF ATTENTION SPANS	• VARIETY OF LEARNING SPACES which allow for different levels of visual and auditory privacy and group size appropriate to the task
• OVERCOMING PHYSICAL BARRIERS	• BARRIER-FREE ENVIRONMENT to allow the physically handicapped access to, and use of, all educational opportunities
• DEVELOPING SPATIAL AWARENESS AND ORIENTATION	• ORDERLINESS AND CONSISTENCY to reduce irrelevant stimuli, ambiguity, and contradiction in the environment • REPETITION AND MULTIPLE CODING repetitive introduction of the same object/idea, with as many ways as possible (numbers, words, colors, textures, shapes) to relate the same meaning • INDOOR/OUTDOOR CONNECTIVITY provisions of natural/outdoor elements for variety and change, spatial and temporal orientation, and use of daylight

The list above demonstrates the range of issues and the potential scope of design responses to mainstreaming. It also demonstrates the main thesis of this paper, that barrier-free environments are part--but only a small part--of mainstreamed settings.

Programming Application: An Example

The following text illustrates the substance and format of one selected design principle. The text describes both the issue and its solutions, including specific design recommendations. This is an attempt to establish an effective communication format, for design guide, which is a secondary objective of this applied research project.

SETTINGS FOR SHARED ACTIVITIES

ISSUE

NORMAL AND EXCEPTIONAL CHILDREN NEED TO INCREASE THEIR AWARENESS AND UNDERSTANDING OF EACH OTHER THROUGH JOINT SOCIAL INTERACTION, COMMON ACTIVITIES, AND COOPERATION.

DISCUSSION

In order to achieve a truly mainstreamed environment, opportunities for learning in a normal social setting should exist. A handicapped child needs not only to interact with others, but to observe the way others interact with each other and with the environment. Regular students need to become more sensitive to the daily problems of the exceptional child by living and working with him or her during parts of the day.

Facilities which boast a mainstreamed environment often have a common entrance, but segregate exceptional children into specialized learning rooms, floors, and wings of a building for most of the day. This segregation encourages stereotyping, stigma and fear. Special entrances which read "handicapped only", a group of special learning rooms, and even a subtle level change may be enough to create a real segregation (Wolfenburger 1977).

Casual social interaction may happen in common areas where children get a chance to relax and move freely. Lounges, libraries, gymnasium, open classrooms, and other activity spaces must also be equally shared and accessible to insure opportunities for interaction and assimilation of all children.

DESIGN PRINCIPLE

SETTINGS FOR SHARED ACTIVITIES

ACTIVITY AREAS SHOULD BE SHARED AND COMMON TO ALL. WHEN SPECIAL EDUCATION ROOMS ARE REQUIRED, THEY SHOULD JOIN AT LEAST SPATIALLY REGULAR ACTIVITY AREAS.

RECOMMENDATIONS

- Classrooms, especially open-plan classes, should read as common ground.
- A variety of spaces should be built into the public domain (lounges, circulation, etc.) to facilitate a range of social interactions, from passive to active. This is important especially when exceptional children are placed in specialized rooms.
- If special education areas or resource rooms are required, they should not be clustered in one part of the building, to discourage identification as "handicapped zone" by other children. These rooms might double-function as a regular activity area, even for brief periods, for the same reason.

CONCLUSION

Most physical interventions which have been undertaken to support mainstreaming have been limited to barrier-free design. These interventions greatly aid the physically and orthopedically handicapped, but offer little assistance to the overwhelming majority of handicapped children. This paper suggests new design principles which are needed to resolve environment-related needs of all handicapped children.

Providing new and more opportunities for the handicapped is a critical societal task. Moreover, there is another compelling reason for this approach: past experience shows that physical improvements in environments for the handicapped result in improvements which benefit everyone.

FOOTNOTES

1. This paper is based in part on the findings of a research project entitled MAINSTREAMING: IMPLICATIONS FOR DESIGN. The project is supported by a grant to the senior author from the Graduate Research Committee, University of Wisconsin-Milwaukee.

2. The concept of design principles and some of the specific design guidelines in this section were developed by the first author and his colleagues in several projects. For further discussion of design principles and their evolution, development, use, and application, see: Cohen (1978); Cohen and Moore (1977); Moore, Cohen, and Team 699 (1977); Moore and Cohen (1978); Progressive Architecture (1978:1); and Moore, Cohen, Oertel, and Van Ryzin (1979).

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